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PATENT SPECIFICATION

(11) 1 245 280

DRAWINGS ATTACHED

(21) Application No. 50868/68 (22) Filed 25 Oct. 1968

(31) Convention Application No. 681794 (32) Filed 9 Nov. 1967 in

(33) United States of America (US)

(45) Complete Specification published 8 Sept. 1971

(51) International Classification B 32 b 29/00 3/30 31/08

(52) Index at acceptance

B5N 17Y 188 189 211 22Y 238 239 250 252X 253X 254X 258X 260X 300X 303X 304X 320 326X 540 542 55Y 582 585 591 620 624 626 641 661 66Y 670 674 679 67X 715 719 71X 726 758 774 784 805

B6J A2

(54) TWO-SIDED CELLULOSE TOWEL AND METHOD OF MAKING

(71) We, KIMBERLY-CLARK CORPORATION, a Corporation organised under the laws of the State of Delaware, United States of America of Neenah, Wisconsin, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to paper towels.

Creped cellulose wadding towels have been employed for many years. The towels are commonly of a one or two-ply construction and vary in basic physical factors such as basis weight, stretchability and surface texture with the specific purpose for which the towelling is intended. One two-ply towelling hitherto proposed is two-sided, that is, has its oppositely disposed sides of different degrees of smoothness; also, the rougher side carries protruding embossments and the degree and nature of embossing is such that a binder or adhesive between plies is not necessary. While such a structure provides a limp towel and is advantageous in many respects for some purposes, a similar towel of a greater degree of softness and which is less compacted and has less tendency to ball up when wetted is frequently desired.

Such a towel in accordance with the invention comprises two superposed creped drawn cellulosic webs, one side of the towelling material having projecting embossments and the second side having depressions corresponding to the embossments, the webs being retained together by a combination of adhesive and mechanical attachment, the side of the towel having the projecting embossments presenting a relatively rough feel to the hand and the side having the depressions presenting a smooth soft feel to the hand of a user of the towelling.

The adhesive is preferably randomly distributed between the webs adjacent to and at some only of the embossments.

A process for producing such towel material in accordance with the invention comprises the steps of applying adhesive to a smooth unembossed surface of a first creped, drawn cellulosic web, embossing a second web in a nip formed between a hard male embossing roll and a soft impression roll to provide protuberances on one side and corresponding depressions on the other side of the second web, carrying the second web without removal from the embosser roll to a nip formed between the embosser roll and a second soft impression roll, feeding the adhesively treated first web to the second nip with the adhesively treated surface fronting on the second web and embosser roll thereby embossing the pattern of the embosser roll into the superposed webs so that the embossed pattern of the second web is imparted to the plied and adhesively united webs.

The initially smooth ply which carries the adhesive, preferably in discrete zones, contacts primarily only the peaks of the pre-embossed sheet so that the adhesive bonding is very limited.

The invention will now be further described by way of example with reference to the accompanying drawings in which:

Figure 1 is a schematic view, with web travels shown, of an apparatus for manufacturing towelling in accordance with the invention;

Figure 2 is a view of towelling material in accordance with the invention and showing the opposed sides of the material; and

Figure 3 is an enlarged and idealised view illustrating the arrangement of the web plies and adhesive in the product.

Referring to the drawings, the numeral 1 in Figure 2 generally designates two-ply towelling material in accordance with the invention. The upper ply or web 4 (Figure 2) on its exposed and upper surface in the figure has a great plurality of depressions 3 resulting from the embossing operation to be described hereinafter. The lower (Figure 2) ply or web

2 on its exposed surface has a plurality of protuberances 5, each protuberance corresponding to a depression in the upper ply 4.

The webs 2, 4 each are of a strong wet-strength containing dry creped and drawn tissue paper having a relatively low stretch characteristic. The dry creped tissue is relatively soft due to the low fibre to fibre bonding and the effect of drawing following creping is to reduce the stretch of the web while retaining the softness. The stretch of the sheet due to the crepe structure, as fed to the embosser, is about 20 to 35% of the sheet length and is in contrast to the known previously mentioned two-sided product which exhibits a stretch of 50% or more. Also, in contrast to the known product, the web is less limp however. The stretch of the sheet at break is somewhat greater, about 5 to 10%, than the stretch due to the crepe structure but is a less significant figure in the practice of the invention.

The plies of the product of Figure 2 may be formed from any of the conventional paper furnishes used in the manufacture of tissue papers. The crepe ratio imparted is suitably in the range of 1.5 to 3 and the single ply web weight is desirably between about 10 and 16 lbs. per 2880 sq. ft.; webs of between about 12 and 14 lbs. per 2880 sq. ft. are preferred. The pulp itself may be kraft, sulphite or other chemical wood pulps, and proportions of groundwood may be included if the sheet strength is suitably maintained and if the presence of a degree of lint can be tolerated. The wet strength of the webs should be at least about 30 to 40% of the dry strength and for this purpose conventional wet strength agents may be incorporated in the web.

The webs 2, 4 (Figure 2) are retained together not only by the effect of the embossing action on the superimposed plies but by adhesive applied to at least one of the webs. This adhesive is preferably deposited in predetermined amounts in discrete, very thin, elongated (Figure 3) zones on the smooth unembossed surface of the web 2, and the adhesive is contacted by some of the protuberances of the web 4 so that the webs are lightly retained together. The protuberances of web 4 also tend to some extent to be bonded to the web 2 by the embossing pressure, that is, there is a simple mechanical attachment. The adhesive commonly will be primarily effective where peaks of the pre-embossed web contact the adhesively treated sheet but the adhesive 14 (Figure 3) will also to some extent lie between flat areas of the plies and on sides of the crepe areas.

The adhesive in the finished product is well taken up by the cellulose, does not apparently stiffen the product, is preferably colourless, not visible to the eye and only apparent when the two webs are carefully separated. Then, the tendency of the webs to adhere in well spaced discrete spots is readily noted. The total amount of adhesive applied is dependent upon the particular adhesive, the amount deposited in each zone, and the number of zones per unit area of web but should be sufficient to ensure that the webs may be adequately bonded for manufacturing operations, packing, shipping and general use without separation. Application of adhesive in discrete zones is desirable to minimise cost and to inhibit against possible product stiffening but is not critical to the attainment of a useful product. Any of a number of adhesives may be used such as polyvinyl acetate emulsion adhesive, polyvinyl alcohol aqueous solutions, synthetic latices and oil soluble adhesives. The adhesives may be water-resistant or water-dispersible as desired, non-rigid film forming and do not deleteriously affect product characteristics when used in small amounts.

Referring now to Figure 1, the numeral 10 designates a rolled sheet of two-ply tissue paper which is a creped, drawn sheet. As illustrated, the webs 2, 4 are separately formed from the rolled two-ply sheet and are directed in separate paths to treating equipment.

Web 2 is directed over one or more guide rolls such as indicated at 11, 12. Suitably, roll 11 may be a Mt. Hope roll serving to spread web 2 as it moves toward adhesive applicator roll 13. The rolls 11, 12 serve to present the web at a predetermined fixed angle to roll 13. Roll 13 is preferably an intaglio roll and is supplied with a fluid adhesive 14 in pond 15 as the roll rotates in the direction indicated by the arrow. The contact of web 2 with intaglio roll 13 is held to a small angle, from the approximately tangential (0°) to preferably not more than 30°. Also, roll 13 is rotated at a slower peripheral speed than the lineal speed at which web 2 is moving so that the web wipes the adhesive from the roll in longitudinally spaced strips.

The web 4 passes over guide roll 16 and is directed around a relatively soft rubber covered roll 17 to nip 18. The nip 18 is formed between the rubber covered roll 17 and a hard male embosser roll 19 of steel. The rubber covered roll has a softness of 180 or greater measured on a Pusey & Jones plastometer such that it will, in large measure, fill in the spacings between protuberances of the hard male patterned roll; the protuberances suitably each have the shape of a frustum of a cone and is conveniently termed a "dull pin" embosser. In specific application the pins are about 1/8" apart on centres and the embossment peaks are about 1/32 to 1/16" diameter.

The web 4 carried by the pins passes from nip 18 to nip 20 formed by embosser 19 and soft rubber covered roll 21 serving as a combining roll and embossing roll. Roll 21 (and roll 17) suitable has a Shore (Durometer A) hardness of 25 to 40) or a Pusey & Jones plastometer value of between 180 and 300. The adhesive-carrying web 2 is united with the pre-embossed web 4 on the pins or teeth of the embosser roll 19. The web 4 is itself subjected to two embossing actions. The first and sole embossing mechanically works the web 4 making it more soft and comfortable; additionally, the first embossing reduces the amount of pressure and energy needed in nip 20 to attain a given degree of embossing of the two superposed plies. That is, a deeper embossing may be effected with less horsepower and less wear on the rolls of the device. Also, since the projections of the pre-embossed web bear against a smooth adhesively treated creped surface of web 2, the extent of adhesive contact is limited in the assembly of the plies during the second embossing of web 2.

The towelling material leaving the nip 20 passes over guide rolls 22, 23 to the usual finishing operations in conventional manner and generally is perforated, wound, slit and packaged at common manufacturing speeds.

In general, we prefer to use as the webs 2, 4 tissue paper having a basis weight per 2880 sq. ft. of 10 to 16 lbs. per ply, the webs containing a wet strength resin such as melamine formaldehyde or urea formaldehyde; the adhesive is, in a preferred embodiment, a polyvinyl alcohol applied at a web speed of 1000-1500 fpm at an applicator roll speed of 300 to 500 fpm, only 0.03 to 0.07 of a pound of the adhesive being required per 2880 sq. ft. of finished product. Such adhesive then commonly covers only 3 to 5% of the web area. Importantly, the stretch in the finished product is commonly low, as low as 15% due to the drawing out of the crepe; a stretch of up to 25% serves the purpose well. Under this condition there is much less tendency of the towelling to ball when wetted.

WHAT WE CLAIM IS:—

1. A process for the manufacture of towelling material in which creped, drawn cellulosic webs are embossed in superposed relation, comprising the steps of applying adhesive to a smooth unembossed surface of a first creped, drawn web, embossing a second web in a nip formed between a hard male embossing roll and a soft impression roll to provide protuberances on one side and corresponding depressions on the other side of the second web, carrying the second web without removal from the embosser roll to a nip formed between the embosser roll and a second soft impression roll, feeding the adhesively treated first web to the second nip with the adhesively treated surface fronting on the second web and embosser roll thereby embossing the pattern of the embosser roll into the superposed webs so that the embossed pattern of the second web is imparted to the plied and adhesively united webs.

2. A process as claimed in Claim 1 in which the adhesive is applied to the first web in discrete zones and only some protuberances of the second web are contacted with the adhesive of the first web in the second nip.

3. A process as claimed in either of the proceeding claims in which the soft impression rolls of the two nips have a Shore (Durometer A) hardness value of between 25 to 40.

4. A process as claimed in any of the preceding claims in which the adhesive applied to the first web covers only 3 to 5% of the web area.

5. Towelling material made by a process as claimed in any of the preceding claims.

6. Towelling material comprising two superposed creped drawn cellulosic webs, one side of the towelling material having projecting embossments and the second side having depressions corresponding to the embossments, the webs being retained together by a combination of adhesive and mechanical attachment.

7. Towelling material as claimed in Claim 6 in which the adhesive is randomly distributed between the webs adjacent to and at some only of the embossments.

8. Towelling material according to Claim 6 or Claim 7 in which the creped, drawn, embossed webs have adhesive covering 3-5% of the area between webs.

9. Towelling material according to any of Claims 5 to 8 in which each web has a basis weight per 2880 sq. ft. of between 10 and 16 pounds.

10. A process as claimed in Claim 1 for producing towelling material substantially as hereinbefore described with reference to the accompanying drawings.

11. Towelling material as claimed in Claim 6 substantially as hereinbefore described with reference to the accompanying drawings.

For the Applicants:
LLOYD WISE, BOULY & HAIG,
Chartered Patent Agents,
Norman House,
105-109 Strand,
London, W.C.2.

(8517) Printed by Her Majesty's Stationery Office Press, Edinburgh, 1971.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

1245280 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

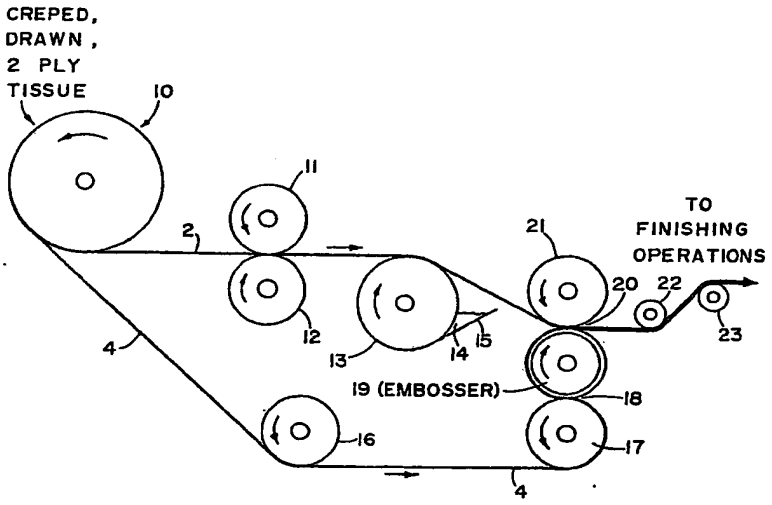

FIG. 1

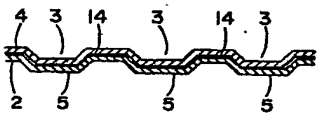

FIG. 3

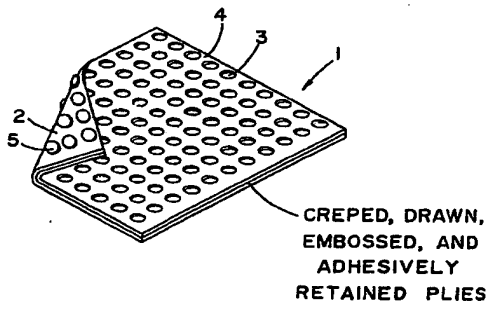

FIG. 2